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EXPERIENCE WITH ARTESIAN WELL WATER AT ELGIN, ILLINOIS[1]

By R. R. Parkin

In 1903–1904 the city of Elgin installed four artesian wells. One 2005 and three 1300 feet deep, and after the wells were completed, a shaft 9 feet in diameter was sunk 115 feet deep. At this depth tunnels 5 feet in diameter in opposite directions were run for about 500 feet, connecting the wells and piped each with 12-inch pipe which are run through the tunnels to central shaft and connected to pumps at the bottom of the shaft. These tunnels are built of concrete and very successfully shut out all seapage into the tunnels.

The wells are as near as possible in a direct line from the shaft. After the shaft and tunnels were finished, each well was plugged below the line of the tunnels with a rubber disc held in place by 2-inch pipe from the surface, shutting off the water below the line of tunnels where a 12-inch disc was cut out in the 12-inch well pipe. On this 12-inch pipe was attached a 12-inch split sleeve to each well pipe. A 12-flange valve was also attached, and from each well was connected 12-inch cast iron flanged pipe back to the shaft and pumps.

In sinking this shaft a great amount of water was encountered which resulted in one contractor abandoning the work. After some delay the work was let to another firm who nearly completed it. After some further delay it was decided to assume and complete the work as designed, which was quite successful. This vein of water referred to, coming from the hillside and flowing towards the river, was estimated from 800,000 to 1,000,000 gallons per day. The contractor used every means of his own to keep the water out. During this time, for several days, quite a flow of sand was noticed coming in with the water, which was being raised out in buckets and pump. Warning was given them to stop this flow of sand or stop the work. This was not taken seriously and they continued until about 3 a.m. when one of our engineers said there was a leak in the filter house. The contractor was at once ordered to stop work immediately. At the station it was found that two filters were out of line. All the damage done was the breaking of a 7-inch flange on one of the filter lines.

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[1] Read at first annual meeting Illinois Section, American Water Works Association, March 10, 1915.

After this the work was done under air pressure of about 16 pounds down to about 65 feet, where blue shale was found and no water. Several 4-inch bleeders had been placed in the cement near this water vein, so that in the future they could be connected with our well system and this water used, but as this vein of water was carrying a large amount of quicksand with it, and had undermined the foundations of filters and buildings, it has not been made use of.

The cement was very successfully gotten into place. The air pressure was kept on for about eight days. When the air was released, very little if any water came through the concrete, and the shaft is quite dry at this time. From this time to 1913 this vein of water has been in our minds as an additional source of supply.

Elgin, like most cities, is growing, and its demands for water increase, and have to be satisfied. In 1913 we were obliged, for the first time in twenty-five years, to restrict our consumers in the use of water for outside use. This called attention to the need of increase of our supply, and after advertising and receiving bids for a deep well, which were quite in excess of former bids received in 1904, it was decided to go after this water referred to, and a local well-driller was employed to, if possible, find the vein. One 6-inch hole had been drilled to bed rock; the first drilled being below the reservoirs some distance from the station. In this hole the water did not rise on reaching the limestone. This was rather an experiment, being about 1000 feet from our shaft.

At the second location being quite sure of finding water, and after drilling into the same limestone which underlies our city, water was found which rose about 26 feet above the limestone in the 6-inch pipe. The temperature of this water was 54 degrees.

Several tests were made by pumping from the surface and at 12 feet below. In the tests it was found that 125 gallons could be raised per minute, lowering the head only a few inches. This was done by weir measurement, and with a larger pump 240 gallons per minute were raised under the same condition. With these results it was decided to sink a shaft of about 6 feet in diameter, starting with a square hole to water line. At this line a platform was built upon which was installed a larger pump driven by 12 h.p. motor, belt connected. This for some days kept the water down so that the men made rapid progress for about 10 feet, mostly in clay. At this depth the pump failed to keep the water down, and another one was procured. After this the work progressed very fast until near the depth of 33 feet when the water increased above the capacity of the pump, and a pulsometer pump was procured, and with the two the water was kept down from the water line. Interlocking steel sheeting was used driven by a piece of railroad iron connected by cable to our hoisting engine. At times when this was hard to drive, a water jet made the driving much easier. Stones were also removed by jetting. It was quite necessary to keep the sheeting 2 or 3 feet below the digging. When too near the bottom the water pressure from below would burst through and choke the suction. The steel sheeting was driven into the limestone which is quite soft and full of water veins, through which the water boiled. After removing several feet of this limestone below the sheeting, a tier of tiles was put in around the bottom one, leaving one out every three feet; where a short piece of 6-inch pipe was used. After these were placed the hole was lined with wooden sheathing allowing a 6-inch space between, which was filled with cement under water through a 4-inch conductor pipe. In this way the cement remained with the mixture. This was carried to above the water line. Up to this line the shaft is round 5 feet 8 inches internal diameter; above this it is 6 feet square. All surface water is entirely shut out. After this shaft was completed one 600-gallon centrifugal pump was purchased. To this we have a 20 h.p. Jenny vertical motor installed at the surface. From tests made since, it shows the pumping to be about 600 gallons per minute, and from present indications will continue to be so, as the head remains about the same.

The analysis of this water made by the State Water Survey pronounces it a very good water.